Creating Coding Stories and Games

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Coding stories and coding games are playful, hands-on ways for children to explore and experiment with early coding. They offer opportunities for interactions and collaborative learning. If coding is new to you, you will find that it builds on many early math and literacy concepts you are familiar with.

What is coding?

Coding (or programming) is a basic language of the digital age. It involves the process of creating step-by-step instructions a computer understands and needs in order for its programs to work. Gaming systems, tablets, cars, cell phones—even washing machines!—all use coding to function properly.

Early coding, or precoding, offers children experiences that integrate communication, thinking, and problem solving. These are 21st century skills that are valuable for children’s future success in our digital world.

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Code: A set of instructions for a computer
Coding: The process of creating step-by-step instructions a computer understands and needs in order for its programs to work
Precoding activities: Developmentally appropriate games and activities in which children explore some of the concepts involved in coding in ways that are meaningful to them.
There are many learning activities preschool children already engage in that relate to coding. I started to think about some aspects of precoding that would be meaningful to preschoolers, and I began to develop a series of activities where children create their own coding stories. Children learn about creating commands, or using directional language, when they make and use maps to locate a treasure during dramatic play and when they give each other instructions while playing with toy cars. Activities related to creating and following commands can be gamelike in nature, such as moving a gaming piece a specific number of spaces on a grid (think Candyland or Chutes and Ladders). Children are naturally drawn to adventurous experiences in which they can explore movement, direction, and location. Many of the same concepts supported in these activities, such as spatial reasoning and number sense, are a foundational part of coding that children can practice without a computer.

Early coding is fun and exciting. The earlier children explore the basics of coding, the more easily they will be able to learn, understand, and apply coding later in life. Many preschoolers are just the right age to begin learning!

**What do children need to know?**

Coding is more accessible to young children than you may think. To participate successfully in precoding activities, children should be introduced to directional language, like *up* and *down*, *backward* and *forward*, *left* and *right*. They need to become familiar with how to count using ordinals (*first*, *second*, *third*) and understand one-to-one correspondence. Some children will have mastered these concepts and others will still be learning. If children are just beginning to understand and follow directional language and use ordinals, the precoding activities that follow will reinforce that learning.

Activities involving location and movement, such as playing board games and giving directions to peers in pretend play, offer some background knowledge and provide entry points for children into coding activities.

**Why introduce coding to preschoolers?**

Coding is like a game. It’s very engaging for children who enjoy telling stories and using grids and maps. Children ages 3 to 5 are able to create drawings of maps that represent relationships between objects and places. When we incorporate programming into early learning settings, we immerse children in versatile activities that align with standards in multiple areas, like math, problem solving, communication, and literacy. Precoding activities offer children opportunities for interaction and collaborative learning, as well.

**Coding stories and games use math**

Coding involves spatial reasoning and logic. Helping children to think about direction, location, and movement strengthens their math skills. Children need to count the number of spaces they must move and indicate in which direction they are headed as they relate objects and locations to one another. Coding integrates a number of math skills into one meaningful experience.

**Coding stories and games encourage problem solving**

When activities like coding provide a challenge for the user or when there are several ways of solving the same problem, children can consider multiple paths for arriving at a solution and choose the most efficient strategy. In these activities, planning ahead is the key to success.

**Coding stories and games strengthen communication**

When a child codes, she needs to indicate directions to another person (or to a computer). Her communications need to be succinct—that is, they cannot be wordy. When two children play coding games, the child receiving the instructions needs to be an active listener in order to move the coding pieces in the correct way. Clear communication and turn taking are essential to coding.

**Coding stories and games promote literacy**

Coding games often tell a story—there is a path the programmer takes to move an object through different obstacles and settings, eventually arriving at a destination. Children’s imaginative stories or favorite retellings can be used as the base for coding games. This helps children develop vocabulary and a greater comprehension of texts. Children can make connections between literature and their lives. They can even change the outcome of a favorite story by exploring different endings in the coding activity. Teachers can lead innovative read-alouds with a gaming board by changing the sequence of a story or reinventing the ending.
Getting started

First, make a grid
You can create a grid of squares using masking tape on the floor or on a tabletop. A grid can also be drawn on a large plastic tablecloth, making it easy to use, transport, and store. For children who want to explore coding further, make large grid paper by tracing black lines on graph paper. This way, a child can draw his own coding story and take it home to share with family members.

Choose your story and gather the corresponding props
Decide if the children are going to retell a favorite story (The Three Little Pigs, Goldilocks) or invent their own tale. For example, if the children choose to explore The Gingerbread Man, they will need a mini gingerbread figure, a wolf, and pictures to represent the places the gingerbread man travels to in the story.

Ensure that children understand the story line and the path they are coding
Determine the starting and ending points of the path the character is going to take. In The Gingerbread Man, the character starts in a cottage, then moves down a lane, through a field, and into the woods. He finally arrives at a stream, where he meets a wolf. If the children are retelling a favorite story, be sure their retelling is in the proper sequence and makes sense. If they are inventing their own story, children can place different settings or obstacles around the grid for a character to maneuver through.

HOW CHILDREN PLAY

1. **Set up the grid.** The teacher or children place the character at the starting point on the grid and put the settings or obstacles on the grid in the order they occur.

2. **Establish the commands.** As a group, the children determine the commands for moving the character along the grid. Directional arrows (which can point up, down, left, or right when placed on the grid) are visual symbols to represent the commands. Children can easily make and use lots of arrows on mini cards or sticky notes.

3. **Choose a programmer and a gamer.** The programmer—or programmers—gives the coding commands. The gamer is the child—or children—who follows the coding commands and moves the figure on the grid.

4. **Code the story!** The programmer is now responsible for giving commands—“Go up 1,” “Go forward 2,” “Go down 3,”—to the gamer so that the gamer can move the character along the grid, from start to finish. (The first few times a group codes, an adult might model the roles for the children.) As a new command is followed, the coder places a symbol card in each square the gaming piece travels through, representing the direction of the move on the grid. Code all the moves until the ending point is reached.

   Encourage and support children so they can complete the entire path, giving and following correct directions without skipping squares on the grid. Ensure that the directional arrows are left in place during the game to represent the path the character has taken. When the character arrives at the final destination, the path is complete! Other children can change the story and have a turn.
EXTENDING THE CODING PLAY

Once children become confident with early coding, they can use it independently in many different ways. Coding naturally and easily complements other learning opportunities in the preschool classroom!

Children can . . .

• Code outdoors by drawing grids on the pavement with chalk and retelling stories using corresponding props
• Create their own coding stories using grid paper by establishing a story line, determining a starting and ending point, and drawing coding symbols directly on the grid
• Create scavenger hunts for one another, placing treasures in the squares of a grid; children can direct one another using a coded message to reach a certain square and then claim the treasure
• Incorporate elements of precoding into their dramatic play, both indoors and out, by drawing or placing grids on top of maps and directing each other using commands to move to different locations (going on an adventure, searching for treasure)
• Invite family or community members to visit the classroom and share ways adults use coding in real life

RESOURCES

“Playful Learning in the Early Years”
mrmclennan.blogspot.ca/search/label/coding

“Playing, Coding, and Higher Order Thinking: Experiences to Support Children’s Learning,” by Tamara Kaldor
www.NAEYC.org/blogs/early-coding-higher-thinking


“Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8”—NAEYC position statement
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